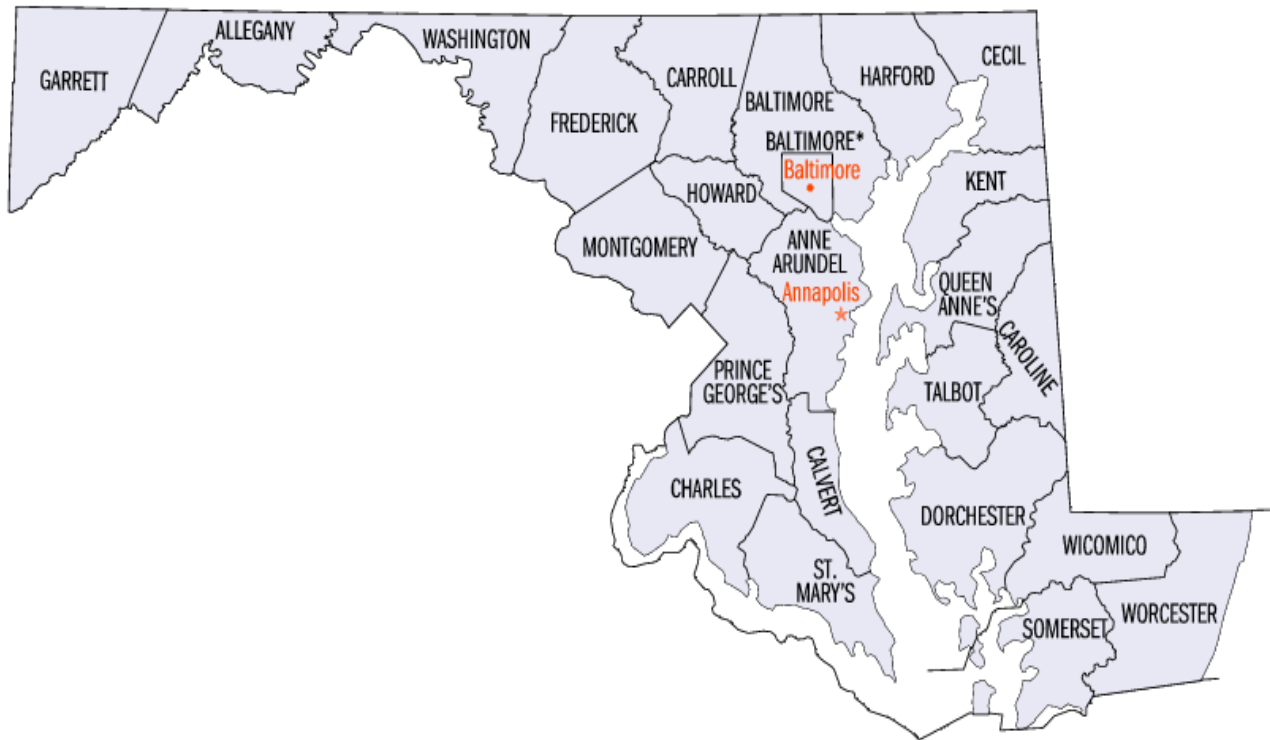


# REPORT OF LABORATORY CONFIRMED CASES OF ANIMAL RABIES IN MARYLAND

## 2004



Map Courtesy of the Department of Commerce,  
Economics and Statistics Administration,  
Bureau of the Census

Boundaries as of January 1, 1990

**Center for Veterinary Public Health  
Office of Epidemiology and Disease Control Programs  
Community Health Administration  
Maryland Department of Health and Mental Hygiene**

## Preface

This report presents surveillance data on laboratory confirmed rabid animals in Maryland in 2004. The Maryland Department of Health and Mental Hygiene's (DHMH) Laboratories Administration tested the majority of the animals. In addition, the Maryland Department of Agriculture (MDA) Animal Health Diagnostic Laboratory in Salisbury also tested select animals for rabies. The DHMH Laboratories Administration, Virology Section, tested all animals involved in human exposure for rabies.

Within DHMH, the Division of Rabies and Vector-borne Diseases determines the number of laboratory confirmed rabid animals reported for each jurisdiction by comparing individual and monthly reports from both laboratories with monthly reports submitted by the 24 local health jurisdictions in Maryland. Rabid animals are reported by the date of specimen receipt at the rabies laboratory and by the jurisdiction submitting the animal for testing. Also included in this document are detailed summary data comparing rabies cases in Maryland over a 20-year period, from 1984-2004.

The Center for Veterinary Public Health (CVPH) would like to thank the communicable disease and environmental health staff of the local health departments in Maryland for their case investigations and reporting of rabies surveillance data. The CVPH would also like to express appreciation to the DHMH Rabies Laboratory and the Salisbury Animal Health Laboratory for their excellent diagnostic work and timely reporting as well as the Centers for Disease Control and Prevention (CDC) for their epidemiological and laboratory support. Finally, we wish to thank three individuals (two CVPH staff members and one student intern) who were instrumental in the preparation of this report: Mary Armolt, who collected and tabulated the data, Sarah Beck who composed and edited the text and refined the tables and graphs, and Kimberly Mitchell who reviewed and edited the document.

## **Report of Laboratory Confirmed Cases of Animal Rabies in Maryland, 2004**

In 2004, the 24 jurisdictions of Maryland reported 336 laboratory confirmed cases of rabies in animals (Tables 1 and 2; Figure 2). The Maryland Department of Health and Mental Hygiene (DHMH) Rabies Laboratory and the Salisbury Animal Health Laboratory collectively received 4861 specimens for diagnostic testing in 2004 (7.04% positive). These data indicate a slight decrease from the number of specimens submitted the previous year (4828 submitted specimens in 2003) and a slight increase from the number of specimens submitted in 2002 (4498 specimens). Despite moderate fluctuations in the number of cases submitted for rabies testing each year, the actual number of confirmed rabid animals has been steadily decreasing since 2001, with 505 rabid animals in 2001, 396 in 2002, and 371 in 2003 (Table 7). Similar to previous years, the largest numbers of specimens were submitted during the summer months, with peaks in July and August (Table 4; Figure 1). As in the past, this pattern can be attributed to more frequent contact between humans and animals as a result of increased outdoor activities during the warmer months.

As in previous years, animal rabies was reported from all 24 Maryland jurisdictions; however, some jurisdictions reported only a few cases in 2004, including Kent county (1), Allegany county (3), and Dorchester and Garrett counties (4 each). These reports are similar to 2003, in which Allegany county reported only one confirmed case and Kent county reported two cases. Jurisdictions with the largest number of laboratory confirmed cases of animal rabies included Montgomery (52), Frederick (46), Baltimore (32), and Anne Arundel (24) counties. Cases in Frederick County dropped from 57 reported in 2003 to 46 in 2004, and cases in Prince George's county dropped from 24 in 2003 to 19 in 2004. However, Montgomery county and Frederick county remain the two jurisdictions with consistently higher numbers of confirmed rabid animals than other Maryland jurisdictions, collectively comprising nearly 30% of the total laboratory confirmed animal rabies cases in 2004.

For the purposes of this report, the main species of concern for rabies infection and transmission are raccoons, bats, cats, dogs, foxes, groundhogs, and skunks, due to a higher occurrence of laboratory confirmed rabies in these species. All other species are categorized as "Other". In 2004, four laboratory confirmed rabid animals were classified in the "Other Species" category: two cattle, one beaver, and one deer (Table 2). Other species that were tested for rabies in 2004 but which yielded negative rabies test results included the following species: chipmunks, ferrets, gerbils, goats, guinea pigs, hamsters, horses, moles, mice, muskrat, opossums, pigs, rabbits, rats, sheep, shrew, squirrels, voles, and six unidentified species listed as "other" in the laboratory reports. Of these, the most commonly tested were squirrels (155) and opossums (139) (Table 3).

Wild animals, including bats, beavers, deer, foxes, raccoons, groundhogs, and skunks, accounted for 95.2% of Maryland's laboratory confirmed rabid animals in 2004 (Table 2). This high percentage of rabies among wildlife remains consistent with rabid animal surveillance findings from 2002 and 2003. As in previous years, raccoons represented the majority of laboratory confirmed rabid animals in 2004 with 244 positive raccoons, or 72.6% of all confirmed rabid animals (compared to 72.5% in 2003). After raccoons, those species making up the greatest proportion of confirmed rabid animals were foxes (24, 7.1% of total rabies cases), bats (23, 6.8%), and skunks (22, 6.5%). Fewer rabies cases were confirmed in other wildlife, including groundhogs (5), beavers (1), and deer (1). In 2003, the numbers of confirmed rabid skunks and bats decreased considerably (7 bats and 16 skunks), while in 2004 these numbers rose again (23 bats and 22 skunks). Despite periodic fluctuations, raccoons remain the wildlife species consistently showing the highest numbers of confirmed rabies cases each year. A detailed breakdown of 2004 animal rabies results by species can be found in Tables 2 and 3.

Local health jurisdictions report rabies test results in both domestic and wild animals. For purposes of this report, the term “domestic animals” is divided into two categories: small domestics and large domestics. Small domestics include dogs, cats, and ferrets; large domestics include livestock (horses, cattle, pigs, sheep, and goats). In 2004, domestic species made up only 4.8% of the total laboratory confirmed animal rabies cases, and most of those domestics were cats (13), which comprised 3.9% of all confirmed rabid animals (Table 1). Other confirmed rabid domestic species included cattle (2) and dogs (1). Similar to previous years, feline rabies infections in 2004 accounted for the largest percentage of domestic animal infections (81.2%); although this figure represents a decrease from the percentage of rabid domestic animals comprised by cats (21, 88%) in 2003 (Table 7). In contrast to 2003, in which one case of rabies was confirmed in a ferret, there were no confirmed rabid ferrets in 2004. In addition, one horse and one pig were confirmed rabid in 2003, while in 2004 no horses or pigs were confirmed with rabies infection.

For clarification, there are three possible laboratory results for rabies tests: positive, negative, and unsatisfactory. The Maryland Department of Health and Mental Hygiene (DHMH) Rabies Laboratory and the Salisbury Animal Health Laboratory routinely run the direct fluorescent antibody test (dFA) on cerebrum, hippocampus, and brainstem tissues. This is a post-mortem test. An unsatisfactory result occurs when the result cannot be obtained or is inconclusive. Most commonly, unsatisfactory test results are seen in small animals, such as bats, with severe autolysis and loss of sufficient fresh brain tissue with which to run the dFA test. In 2004, 85 animals were determined to have unsatisfactory test results, 30 of which were from bats (Table 6). This data has been included in this 2004 rabies annual report; however it is important to note that in 2003, all unsatisfactory data was omitted from the final report. This data has been included in this document for completeness and to better illustrate the implications for rabies post-exposure management. For practical purposes, cases in which there were human exposures to an animal with an unsatisfactory test result were treated as if the result were positive, generally resulting in recommendations for human rabies post-exposure prophylaxis (PEP).

No cases of rabies in humans were reported in Maryland during 2004.

**Table 1: Laboratory Confirmed Cases of Animal Rabies by  
Jurisdiction and Species, in Maryland, 2004**

Jurisdiction	Bat	Cat	Dog	Fox	Groundhog	Raccoon	Skunk	Other**	TOTAL
Allegany						3			3
Anne Arundel	5				2	17			24
Baltimore	2	2		2	1	24	1		32
Baltimore City	2					3			5
Calvert				2		5	1		8
Caroline	1					10	3		14
Carroll		5		2		6	1		14
Cecil	1					11		1	13
Charles				1		5	1		7
Dorchester					1	3			4
Frederick	1			3		33	6	3	46
Garrett						4			4
Harford				2		13			15
Howard				3		3	1		7
Kent				1					1
Montgomery	6	3		2	1	38	2		52
Prince George	2	2		2		13			19
Queen Anne's				1		7	1		9
Somerset			1			6			7
St. Mary's						7	2		9
Talbot						12			12
Washington				1		7	2		10
Wicomico	1	1				6	1		9
Worcester	2			2		8			12
<b>Total Positive</b>	<b>23</b>	<b>13</b>	<b>1</b>	<b>24</b>	<b>5</b>	<b>244</b>	<b>22</b>	<b>4</b>	<b>336</b>
<b>Total Tested</b>	<b>737</b>	<b>1719</b>	<b>838</b>	<b>134</b>	<b>173</b>	<b>569</b>	<b>44</b>	<b>1873</b>	<b>4861</b>

\*\* Includes cattle (2), beaver (1), and deer (1).

**Table 2: Laboratory Confirmed Cases of Animal Rabies by Species in Maryland, 2004**

Species	Frequency	Percent Positive
Raccoons	244	72.6
Foxes	24	7.1
Bats	23	6.8
Skunks	22	6.5
Cats	13	3.9
Groundhogs	5	1.5
Cattle	2	0.6
Beavers	1	0.3
Deer	1	0.3
Dogs	1	0.3
<b>TOTAL</b>	<b>336</b>	<b>100</b>

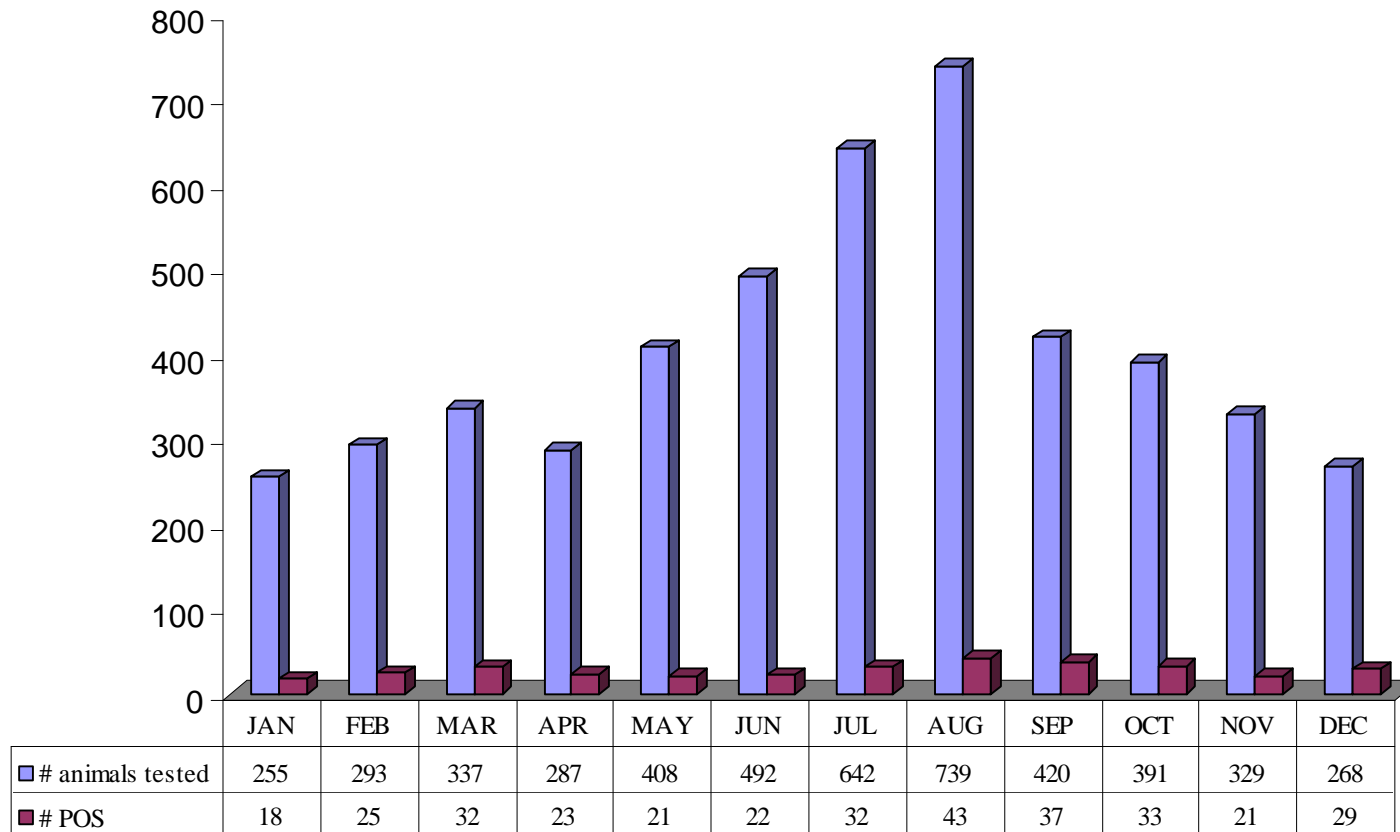
**Table 3: Number of “Other Animal Species” Tested for Rabies in Maryland, 2004**

Other Species	NEG	POS	UNS	Grand Total
Beaver	1	1		2
Chipmunk	10			10
Cow	32	2		34
Deer	12	1		13
Ferret	15			15
Gerbil	2			2
Goat	26			26
Guinea Pig	2			2
Hamster	15			15
Horse	37			37
Mole	10		2	12
Mouse	35		1	36
Muskrat	3			3
Opossum	125		14	139
Other	6			6
Pig	1			1
Pony	1			1
Rabbit	63		2	65
Rat	54		3	57
Sheep	10			10
Shrew	3			3
Squirrel	153		2	155
Vole	3			3
<b>Grand Total</b>	<b>619</b>	<b>4</b>	<b>24</b>	<b>647</b>

**Table 4: Laboratory Confirmed Rabid Animals by Month and Species in Maryland, 2004**

<b>Month</b>	<b>Bats</b>	<b>Beaver</b>	<b>Cats</b>	<b>Cattle</b>	<b>Deer</b>	<b>Dogs</b>	<b>Foxes</b>	<b>Raccoons</b>	<b>Groundhogs</b>	<b>Skunks</b>	<b>TOTAL</b>
<b>JAN</b>	<b>1</b>		<b>1</b>					<b>16</b>			<b>18</b>
<b>FEB</b>							<b>1</b>	<b>22</b>		<b>2</b>	<b>25</b>
<b>MAR</b>				<b>1</b>			<b>4</b>	<b>27</b>			<b>32</b>
<b>APR</b>	<b>1</b>			<b>1</b>			<b>3</b>	<b>16</b>		<b>2</b>	<b>23</b>
<b>MAY</b>	<b>2</b>						<b>2</b>	<b>15</b>	<b>1</b>	<b>1</b>	<b>21</b>
<b>JUN</b>		<b>1</b>	<b>1</b>					<b>18</b>	<b>1</b>	<b>1</b>	<b>22</b>
<b>JUL</b>	<b>6</b>		<b>2</b>			<b>1</b>	<b>4</b>	<b>16</b>	<b>1</b>	<b>2</b>	<b>32</b>
<b>AUG</b>	<b>8</b>		<b>4</b>				<b>3</b>	<b>25</b>	<b>1</b>	<b>2</b>	<b>43</b>
<b>SEP</b>	<b>3</b>						<b>3</b>	<b>30</b>	<b>1</b>		<b>37</b>
<b>OCT</b>	<b>2</b>		<b>3</b>		<b>1</b>		<b>2</b>	<b>20</b>		<b>5</b>	<b>33</b>
<b>NOV</b>			<b>1</b>				<b>1</b>	<b>16</b>		<b>3</b>	<b>21</b>
<b>DEC</b>			<b>1</b>				<b>1</b>	<b>23</b>		<b>4</b>	<b>29</b>
<b>TOT</b>	<b>23</b>	<b>1</b>	<b>13</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>24</b>	<b>244</b>	<b>5</b>	<b>22</b>	<b>336</b>

**Figure 1: Laboratory Confirmed Rabid Animals (n=336) and Total Animals Tested for Rabies (n=4861) in Maryland, 2004**





**Table 5: Laboratory Confirmed Rabid Animals and Animals Tested for Rabies by Jurisdiction and Species in Maryland, 2004**

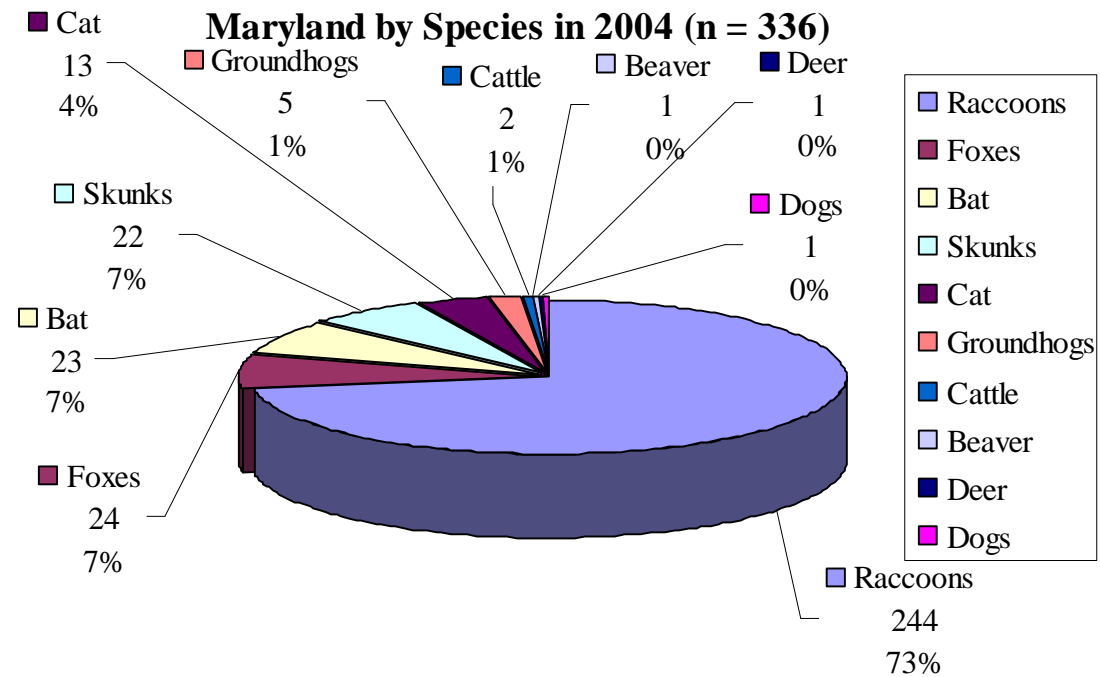
Jurisdiction	Bats		Cats		Dogs		Foxes		Groundhogs		Raccoons		Skunks		Other Species		TOTAL	
	POS	Tested	POS	Tested	POS	Tested	POS	Tested	POS	Tested	POS	Tested	POS	Tested	POS	Tested	POS	Tested
Allegany		11		49		12		1			3	5		2		3	3	83
Anne Arundel	5	161		186		91		8	2	16	17	56		1		88	24	607
Baltimore	2	27	2	175		122	2	9	1	15	24	57	1	2		27	32	434
Baltimore City	2	104		107		114		4			3	35				10	5	374
Calvert		4		22		13	2	5		4	5	10	1	3		9	8	70
Caroline	1	2		24		16		3			10	12	3	2		14	14	73
Carroll		8	5	112		20	2	7		16	6	12	1	3		2	14	180
Cecil	1	5		47		19		2		2	11	12			1	10	13	97
Charles		23		43		26	1	4		3	5	13	1	3		27	7	142
Dorchester		2		19		11		1	1	2	3	5				5	4	45
Frederick	1	12		153		51	3	22		28	33	65	6	8	3	106	46	445
Garrett		5		10		4		2		1	4	16		1		8	4	47
Harford		12		104		47	2	8		7	13	20				22	15	220
Howard		4		51		29	3	6		20	3	7	1	2		19	7	138
Kent		2		15		2	1	1				2				2	1	24
Montgomery	6	116	3	232		94	2	25	1	28	38	127	2	7		146	52	775
Prince George's	2	201	2	163		74	2	12		15	13	36		1		76	19	578
Queen Anne's		12		26		26	1	4		3	7	12	1	1		13	9	97
St. Mary's		1		6		3					7	10	2			9	9	29
Somerset		2		17	1	3				2	6	10		3		7	7	44
Talbot		3		32		7		3			12	17				5	12	67
Washington		6		78		26	1	3		7	7	7	2	4		11	10	142
Wicomico	1	9	1	27		21		1		4	6	8	1	1		15	9	86
Worcester	2	5		21		7	2	3			8	15				13	12	64
<b>TOTAL</b>	<b>23</b>	<b>737</b>	<b>13</b>	<b>1719</b>	<b>1</b>	<b>838</b>	<b>24</b>	<b>134</b>	<b>5</b>	<b>173</b>	<b>244</b>	<b>569</b>	<b>22</b>	<b>44</b>	<b>4</b>	<b>647</b>	<b>336</b>	<b>4861</b>

**Table 6: Animals with Unsatisfactory Rabies Test Results by Jurisdiction in Maryland, 2004**

<b>Jurisdiction</b>	<b>Bats</b>	<b>Cats</b>	<b>Dogs</b>	<b>Foxes</b>	<b>Groundhogs</b>	<b>Raccoons</b>	<b>Skunks</b>	<b>Other Species</b>	<b>TOTAL</b>
<b>Allegany</b>	1	0	0	0	0	0	0	1	2
<b>Anne Arundel</b>	6	1	1	1	0	0	0	7	16
<b>Baltimore</b>	4	0	0	0	1	0	0	1	6
<b>Baltimore City</b>	4	0	0	0	0	0	0	0	4
<b>Calvert</b>	0	0	0	0	0	0	0	0	0
<b>Caroline</b>	0	0	1	0	0	0	0	0	1
<b>Carroll</b>	0	1	0	0	1	1	0	0	3
<b>Cecil</b>	0	1	0	0	0	0	0	1	2
<b>Charles</b>	1	1	0	0	0	0	0	3	5
<b>Dorchester</b>	0	0	0	0	0	0	0	0	0
<b>Frederick</b>	2	0	0	0	1	0	0	1	4
<b>Garrett</b>	0	0	0	0	0	0	0	0	0
<b>Harford</b>	2	0	0	1	1	0	0	1	5
<b>Howard</b>	0	0	0	0	1	0	0	0	1
<b>Kent</b>	0	0	0	0	0	0	0	0	0
<b>Montgomery</b>	3	1	0	1	0	6	1	7	19
<b>Prince George's</b>	5	1	0	2	0	0	0	2	10
<b>Queen Anne's</b>	2	0	0	0	1	0	0	0	3
<b>St. Mary's</b>	0	1	0	0	0	0	1	0	2
<b>Somerset</b>	0	0	0	0	0	0	0	0	0
<b>Talbot</b>	0	0	0	0	0	1	0	0	1
<b>Washington</b>	0	0	0	0	0	0	0	0	0
<b>Wicomico</b>	0	0	0	0	0	0	0	0	0
<b>Worcester</b>	0	1	0	0	0	0	0	0	1
<b>TOTAL</b>	<b>30</b>	<b>8</b>	<b>2</b>	<b>5</b>	<b>6</b>	<b>8</b>	<b>2</b>	<b>15</b>	<b>85</b>

**Figure 2: Laboratory Confirmed Rabid Animals in**

**Maryland by Species in 2004 (n = 336)**



**Table 7: Laboratory Confirmed Rabies by Species 1980 –2004**

Species	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
<b>All Species</b>	1101	760	683	450	338	389	468	579	553	624	520	441	638	619	439	394	413	505	396	366	336
<b>Raccoons</b>	964	672	586	384	255	295	382	467	413	501	412	326	512	494	346	311	313	366	272	263	244
<b>Other species</b>	137	88	97	66	83	94	86	112	140	123	108	115	126	125	93	83	100	139	114	103	92

Species	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	TOT
<b>Bats</b>	46	34	28	18	21	26	14	13	17	9	5	10	11	11	8	4	17	27	35	7	23	<b>472</b>
<b>Beavers</b>								1						1		1					1	<b>3</b>
<b>Cats</b>	15	11	18	2	13	16	11	15	22	21	9	17	19	23	12	19	18	23	11	21	13	<b>329</b>
<b>Cattle</b>	2	3	3	2	2		2	1			1	2	2	1	3	1	2	1	2	2	2	<b>35</b>
<b>Chipmunk</b>																		1				<b>1</b>
<b>Deer</b>	1		1		1														1		1	<b>3</b>
<b>Dogs</b>	1	1		4		2	1	2	2	3	2	2	1	1	2		1	1	1	2	1	<b>30</b>
<b>Ferrets</b>											1									1		<b>1</b>
<b>Foxes</b>	19	21	25	18	21	23	17	18	27	21	30	36	34	44	27	22	28	38	30	39	24	<b>564</b>
<b>Goats</b>			1		1																	<b>2</b>
<b>Groundhogs</b>	14	7	7	2	5	4	4	10	6	6	4	6	13	6	5	7	9	5	7	12	5	<b>146</b>
<b>Horses</b>	1	2	1			3	1	1	1	2	1	1				2		1	3	1		<b>21</b>
<b>Muskrats</b>										1												<b>1</b>
<b>Opossums</b>	2	1										2		1			1			1		<b>7</b>
<b>Otters</b>							1			1			1									<b>3</b>
<b>Pig</b>																				1		
<b>Rabbits</b>	1														2							<b>3</b>
<b>Raccoons</b>	964	672	586	384	255	295	382	467	413	501	412	326	512	494	346	311	313	366	272	263	244	<b>8903</b>
<b>Rats</b>	1																					<b>1</b>
<b>Sheep</b>						1							1									<b>2</b>
<b>Skunks</b>	32	6	12	20	19	19	35	51	65	59	55	39	44	37	34	26	24	42	34	16	22	<b>712</b>
<b>Squirrels</b>	2	2	1																			<b>5</b>
<b>Weasels</b>																1						<b>1</b>
<b>TOTAL</b>	<b>1101</b>	<b>760</b>	<b>683</b>	<b>450</b>	<b>338</b>	<b>389</b>	<b>468</b>	<b>579</b>	<b>553</b>	<b>624</b>	<b>520</b>	<b>441</b>	<b>638</b>	<b>619</b>	<b>439</b>	<b>394</b>	<b>413</b>	<b>505</b>	<b>396</b>	<b>366</b>	<b>336</b>	<b>11245</b>